

## STUDY AND ANALYSIS OF PARKING CHARACTERISTICS (AGI, HYDERABAD)

SRUTHILAYA DARA<sup>1</sup>, RAJITHA DESHADI<sup>2</sup> & Dr. P. PRADEEP KUMAR<sup>3</sup>

<sup>1,2</sup>Assistant Professor, Department of Civil Engineering, Anurag Group of Institutions, Hyderabad, Telangana, India

<sup>3</sup>Associate Professor, Department of Civil Engineering, Anurag Group of Institutions, Hyderabad, Telangana, India

### ABSTRACT

*Parking has become a major necessity in the urban areas and metropolitan cities. The accumulation of vehicles in an inappropriate order creates congestion for movement of vehicles and creates chaotic conditions at that particular area. To overcome this kind of dishevelment of vehicles parking is to be provided. The objective of this study is to redesign the existing parking area of Anurag Group of Institutions, Hyderabad. Firstly, the work is progressed by regulating the work area calculation using total station followed by domesticating "In-out Survey" method. The composed data is used to redesign the parking area by using Autodesk Vehicle Tracking System software. The main intention of the work is to redesign an appropriate parking area in Anurag Group of Institutions campus which could accommodate parking spaces for maximum vehicles in its limited and existing parking.*

**KEYWORDS:** Off-street Parking, Traffic Volume, Autodesk Vehicle Tracking System Software & In-out Survey

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### INTRODUCTION

Parking is a curb provided for vehicles at a place for temporary use and for movement of goods and passengers. As there is a rapid growth in the usage of vehicles, this has become a basic problem for the citizens. Therefore, demand for parking has been increased in cities. Market areas and food and drink-vending areas exhibit high parking demand when compared to that of official and residential areas [1]. As a matter of fact, due to availability of less space and assemblage of large crowd either in public or private places creates chaotic conditions for parking of vehicles. Due to this, large assortment of people and vehicles leads to many problems like accidents, heavy pollution and delay in the migration of vehicles. Therefore, these kind of conditions not only have a greater economic impact but also an impact on the mode of transportation. To manage these kinds of chaotic conditions and to overcome the problems, parking has to be analyzed. The analysis of the parking demand has to be as per the requirement of vehicles in different places according to the availability of space. In order to demarcate the parking demand, different kinds of parking facilities can be used like off-street and on-street parking. On-street parking is considered as safe parking, as it provides with different kinds of angles along the curb length which is adopted in our work. Likewise, a new approach for optimal design with maximum capacity in corner lots for particular parking spaces can also be designed by a system of nonlinear equations with optimal solution [2]. In general terms, parking has different requirements according to the zone, availability of space provided and has parking rules that has to be followed according to IRC code. In order to satisfy these requirements, firstly, the data has to be collected and analyzed. At the present time, the data for already existing parking area has been collected followed by performing in-out survey to obtain parking patterns and demands. Likewise, the survey performed is a part of parking studies method which is the analysis of number of vehicles parked at an instant of time in a provided space

at communities, shopping malls, institutions or any other gathering places, etc. Therefore, by using these parking studies, a systematic study of parking characteristic, demand and regulatory measures are obtained in AGI, Hyderabad. The main intention of the work is to redesign an appropriate parking area in Anurag Group of Institutions campus which could accommodate parking spaces for maximum vehicles in its limited and existing parking.

## STUDY AND SURVEY OF EXISTING PARKING AREA

In order to redesign the parking area in AGI, Hyderabad, parking area has been calculated by using total station. Certain points were generated and transferred into the Automated Computer-Aided Design and Drafting software for creating the boundary layout from the generated points for parking area as the initial step in this work. Hence, the total parking area available for this layout is 1140.40 m<sup>2</sup>. Therefore, the obtained layout is divided into four partitions according to the points generated during the survey. In between the layout, the obstructions can be seen in the below figure provided which are inbuilt. The individual areas of each partition are 266.462 m<sup>2</sup>, 320.192 m<sup>2</sup>, 403.036 m<sup>2</sup> and 150.713 m<sup>2</sup>.



**Figure 1: Parking Area Generated from Total Station.**

Figure 1 represents the existing parking area which has been surveyed by using total station in which the points have been generated and exported to DWG format.



**Figure 2: Boundary Layout of Existing Parking Area.**

Figure 2 represents the boundary layout of existing parking area drawn from the generated DWG format file from the total station which has been divided into four partitions.

From this layout, total traffic volume and peak flow of the college parking area is obtained by using In-Out survey method with a fixed amount of time for two hours at a time interval of half an hour each between a period of 8:30 a.m. to

10:30 a.m. Data is obtained by conducting the survey manually by counting the two-wheeler and four-wheeler individually to know the parking spaces accumulation and after the survey, the data collected is inserted to Vehicle Tracking design software which is a transportation analysis and parking design software for building the vehicle swept path analysis. Hence, the design of the parking lot is done by using this software. The obtained data is being represented in graphs.

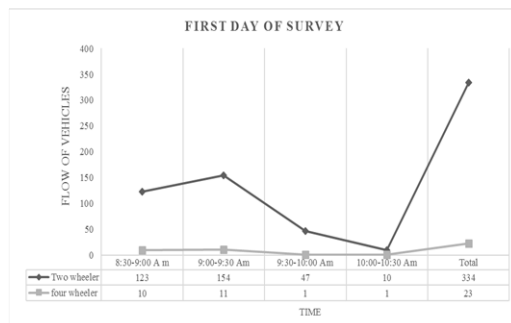


Figure 3: Graph of In-Out Survey of Day-1.

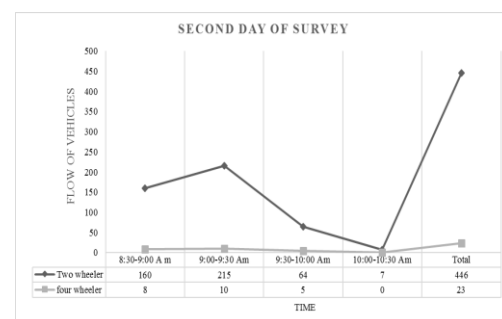


Figure 4: Graph of In-Out Survey of Day-2.

It has been observed that the peak hour is between 9:00 to 9:30 a.m. and a number of 154 two wheeled and 11 four-wheeled vehicles are meeting the demand at first day of survey and a number of 215 two-wheeled and 5 four-wheeled vehicles have been accommodated during the second day of survey.

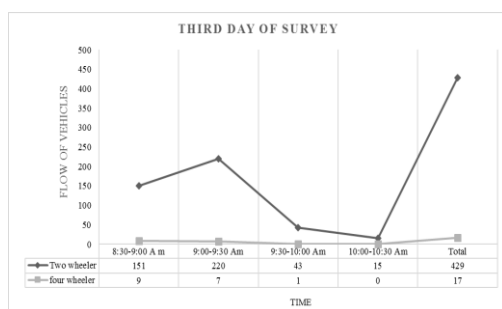


Figure 5: Graph of In-Out Survey of Day-3.

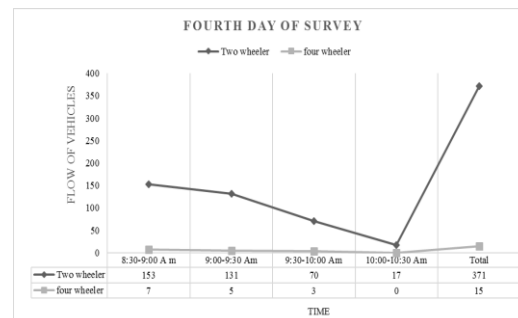


Figure 6: Graph of In-Out Survey of Day-4.

It has been observed that the peak hour is between 9:00 to 9:30 a.m. and a number of 220 two-wheeled and 7 four-wheeled vehicles are meeting the demand at third day of survey and a number of 131 two-wheeled and 5 four-wheeled vehicles have been accommodated during the fourth day of survey during the middle of the week.

Figures 7 and 8 represent the peak hour obtained between 9:00 and 9:30 a.m. with a number of 145 two-wheeled and 5 four-wheeled vehicles meeting the demand for the fifth day of survey and a number of 120 two-wheeled and 6 four-wheeled vehicles have been accommodated during the sixth day of survey.

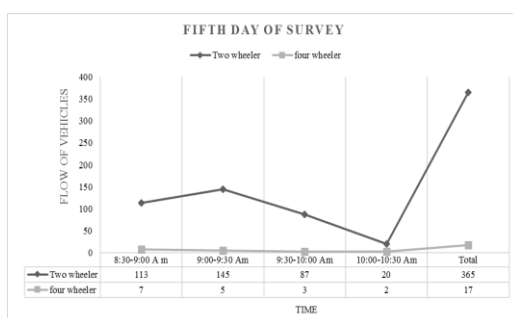


Figure 7: Graph of In-Out Survey of Day-5.

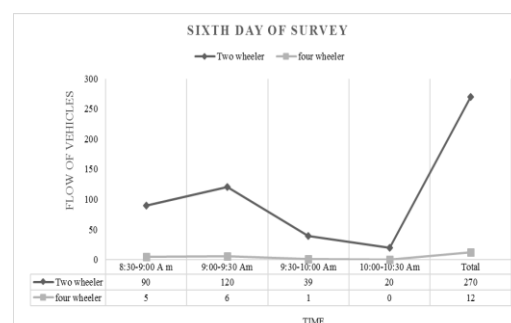


Figure 8: Graph of In-Out Survey of Day-6.

Figures 8 and 9 represent the peak hour obtained between 9:00 to 9:30 a.m. with a number of 238 two-wheeled and 20 four-wheeled vehicles meeting the demand for the seventh day of survey and a number of 80 two-wheeled and 14 four-wheeled vehicles have been accommodated during the eighth day of survey. The number of four-wheeled vehicles have been increased compared to the previous days, as the survey is conducted during weekends.

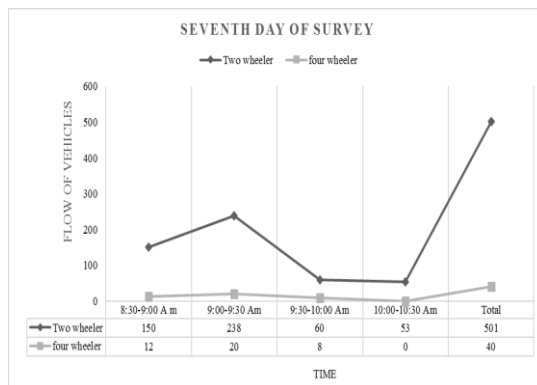


Figure 9: Graph of In-Out Survey of Day-7.

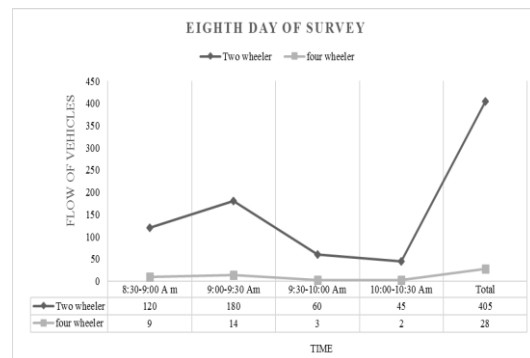


Figure 10: Graph of In-Out Survey of Day-8.

The above graphs have given an average peak time during 9:00 to 9:30 a.m. This hour is considered to be a peak hour because the survey has been conducted in an educational institution; therefore, the number of vehicles acquired are high in number, mostly two wheelers and very few four-wheeled vehicles since the students are more predominant in number.

## DESIGN METHODOLOGY

Parking layout which is prepared using the AutoCAD software will be the input source for this Vehicle Tracking. As per general standard dimensions, two-wheelers are considered as 1 m x 2.5 m and for four-wheelers, it is considered as 3 m x 5 m. As per the data obtained, the number of two wheelers are high in number, so the total parking area is redesigned with different angles like right angles, 60° and 45° to know the capacity of the two wheelers and also by the combination of two and four-wheeler by keeping the four-wheeler number constant since the availability of four-wheeled vehicles is very less in number. Therefore, the parking area is redesigned simultaneously for the better comparison of redesigned parking area and the capacity of the parking lot. A detail of two-wheeler occupying maximum area for angle of 90° is shown in figure 11.

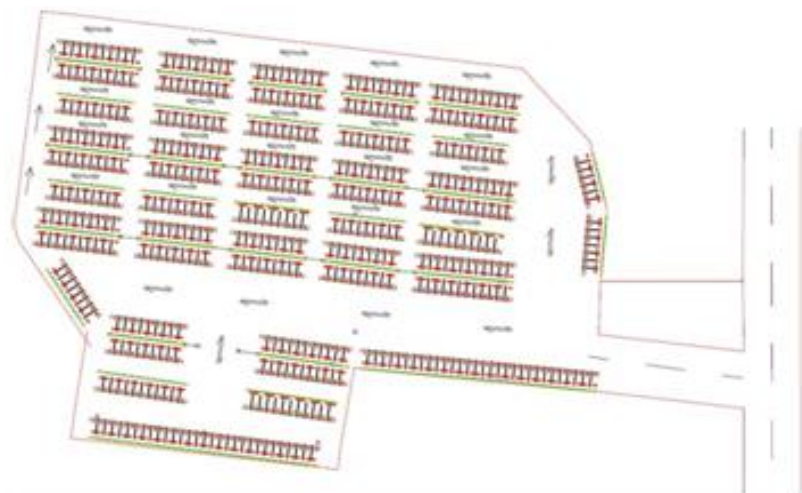
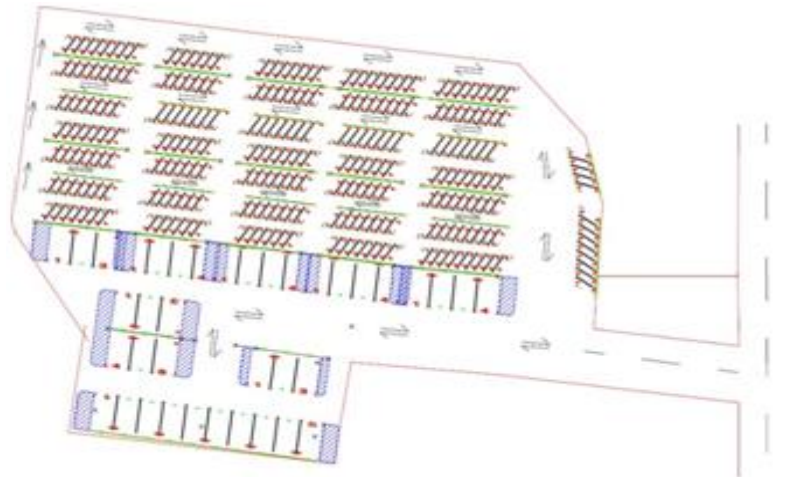


Figure 11: Design of Parking Area for Two Wheelers Provided an Angle of 90°.

### 60° Angle Parking

Comparison of the capacities between 90° and 60° in the below design is made where angle is provided for only two wheelers, as the four-wheeled vehicles obtained are very less in the case of angle provided for 90°. Hence, the parking area conditions and the parking capacity obtained for 60° angle for two wheelers is 328 stalls and for four wheelers is 38 stalls.



**Figure 12: Parking Area of Two-Wheelers at 60° and Four-Wheelers at 90° Angle.**

### 45° Angle Parking

Comparison between the capacity of 90° and 45° is provided and shown in the below design where angle of 45° is provided for two wheelers and 90° is provided for the four-wheeler. The capacity of two wheelers is only 253 stalls and only 38 stalls for four-wheeled vehicles.



**Figure 13: Angles Provided are 45° for Two Wheelers and 90° for Four Wheelers.**

### Design of Two and Four-Wheeler Provided an Angle of 90°

Actual representation of parking area has been shown in Figure 14, although the angles like 60° and 45° provided, 90° angle has a greater number of accommodation of stalls compared to that of the remaining angles; therefore, the Autodesk Vehicle Tracking software has represented that as the angle provided increases, then it can accommodate more number of



vehicles. Therefore, the 90° angle provided has accommodated a maximum of 441 stalls for two wheelers and 38 stalls for four-wheeled vehicles.



Figure 14: Angles Provided are 90° for Two Wheelers and Four Wheelers.

#### Comparison of Parking Accumulation with Provided Angles

Based upon the survey conducted and software used, a table of comparison between different kinds of angles provided has been represented. This table provides a brief information of the number of stalls accommodated. 90° angle parking has accommodated more number of vehicles compared to that of other angles provided to redesign the parking area.

Table 1: Comparison of Angles Provided for Redesigning of Parking Area.

	Standard	Bay type	Vehicle Class	Service type	Zone	Count	Percentage
90°	Copy of Indian Two Wheeler	Normal	First Class	Two wheeler	(unnamed)	574	100%
	Copy of Indian Four Wheeler	Normal	-	-	-	-	-
	Total Stalls	-	-	-	-	574	100%
60°	Standard	Bay type	Vehicle Class	Service type	Zone	Count	Percentage
	Copy of Indian Two Wheeler	Normal	First Class	Two wheeler	(unnamed)	328	
	Copy of Indian Four Wheeler	Normal	First Class	Four Wheeler	(unnamed)	38	11.59%
45°	Total Stalls	-	-	-	-	366	100%
	Standard	Bay type	Vehicle Class	Service type	Zone	Count	Percentage
	Copy of Indian Two Wheeler	Normal	First Class	Two wheeler	(unnamed)	253	
45°	Copy of Indian Two Wheeler	Normal	First Class	Four Wheeler	(unnamed)	38	15.02%
	Total Stalls	-	-	-	-	291	100%

#### CONCLUSIONS

This paper has analyzed the characteristics of parking in a systematic methodology. Inherently, the existing parking area has been interpreted. Constraints of the exiting parking area has been obtained and analyzed. Then the parking characteristics are obtained by conducting in-out survey for particular interval of time. With relevance to the survey conducted, the parking area has been divided into four bays by using Autodesk vehicle software, which gives the number of stalls accommodated at different angles provided like 90°, 60° and 45°. Interpreted data has been compared in Table 1 with different angles provided. Hence AGI, parking area has been redesigned accordingly. Finally, the result has demonstrated that as the angle provided for particular parking area increases then the number of vehicles accommodated in

the parking bay also increases. Therefore, according to the existing parking area of AGI, it is represented that more number of two and four wheelers can be accommodated when parking area has been redesigned and can accommodate more number of vehicles in the stalls when a right angle, i.e., 90° angle is provided. Although the survey is done only for few days, the results obtained are satisfactory.

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## AUTHOR'S PROFILE



**Sruthilaya Dara** is an Assistant professor in Department of Civil Engineering, Anurag Group of Institutions, India. She got her bachelor degree in the discipline of Civil Engineering (B. Tech – Civil Engineering) with 70 percent in Kakatiya Institute of Technology and Science for the year 2009-2013. And she did her post-graduation in the discipline of Construction Management (M. Tech – Construction Management) with 79.80 percent in Vasthlaya Institute and Technology and Science for the year 2015-2017. The research study on "Life Cycle Assessment of Cement Industry" was chosen for her post graduate research work. She has participated in four national conferences. She also has proficiency on CAD, STAAD PRO and C-6 software.



**Dr. P. Pradeep Kumar** is an Associate professor in Department of Civil Engineering, Anurag Group of Institutions, India. He got his bachelor degree in the discipline of Civil Engineering (B. E – Civil Engineering) with 67 percent from Osmania University 2007. And He did his post-graduation in the discipline of Geotechnical Engineering (M. Tech – Geotechnical Engineering) with a CPI of 7.59 from Indian Institute of Technology, Roorkee, 2009. The research study on “Probabilistic Analysis of Strip Footing on Layered Soil Media Using Monte Carlo Simulation ” was chosen for his post graduate research work. He has completed his Ph.D in the year 2013. He has participated in five international conferences. He also has proficiency on ANSYS and CAD



**D. Rajitha** is an Assistant professor in Department of Civil Engineering, Anurag Group of Institutions, India. She got her bachelor degree (B.SC) with 80.10 percent in Osmania University for the year 2010-2013. And she did her Master’s degree in the discipline of Geology (M.SC – Geology) with 74.43 percent in Osmania University for the year 2013-2015. The research study on "Geological Study of Iron Ore" was chosen for her post graduate research work. Now she is doing her doctorate programme in the discipline of Geology at Osmania University. She has participated in three national conferences. She also has proficiency on RS & GIS and CAD Software.



